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CYCLES OF INFLUENZA

A striking characteristic of recent influenza epidemics is their periodicity. Their study from this point of view helps us to understand the past and raises certain questions as to possibilities for the future. This is brought out very clearly by a survey just completed of the deathrates from influenza among the Industrial policyholders of the Metropolitan Life Insurance Company in the weeks elapsed since 1920. Deathrates observed week by week range from something under one per 100,000 per annum during the thirty-fourth week (August) of the year 1924, to the high peak of 441 per 100,000 per annum during the seventh week (February) of the year 1920. The series of deathrates shows a clearly marked periodicity, high spots being reached every third year. To this rule there has been no exception whatsoever during the period 1920 to 1930. The year 1920 was an exceptionally bad influenza year, the worst in the series, with the deathrate mounting to over 440 per 100,000 in the seventh week (February), as already observed. Next, in 1923, the deathrate from influenza rose to 121 per 100,000 per annum in the ninth week (February-March). Again in 1926, the deathrate from influenza rose to 115 per 100,000 per annum in the thirteenth week (March-April) and lastly, in 1929, the deathrate from influenza rose to 266 per 100,000 per annum in the third week (late January).

These are the only years in the series when the deathrate from influenza in any week exceeded 100 per 100,000 per annum, and the notable fact is that they are systematically spaced three years apart. Such are the main and outstanding features of the analysis of the deathrates of this series of years. But there are a number of other striking features disclosed when we study the series more in detail. This is best shown by reference to the diagrams on page 3 in which the series of weekly deathrates has been plotted in three panels. The first panel contains the graph of the deathrate for

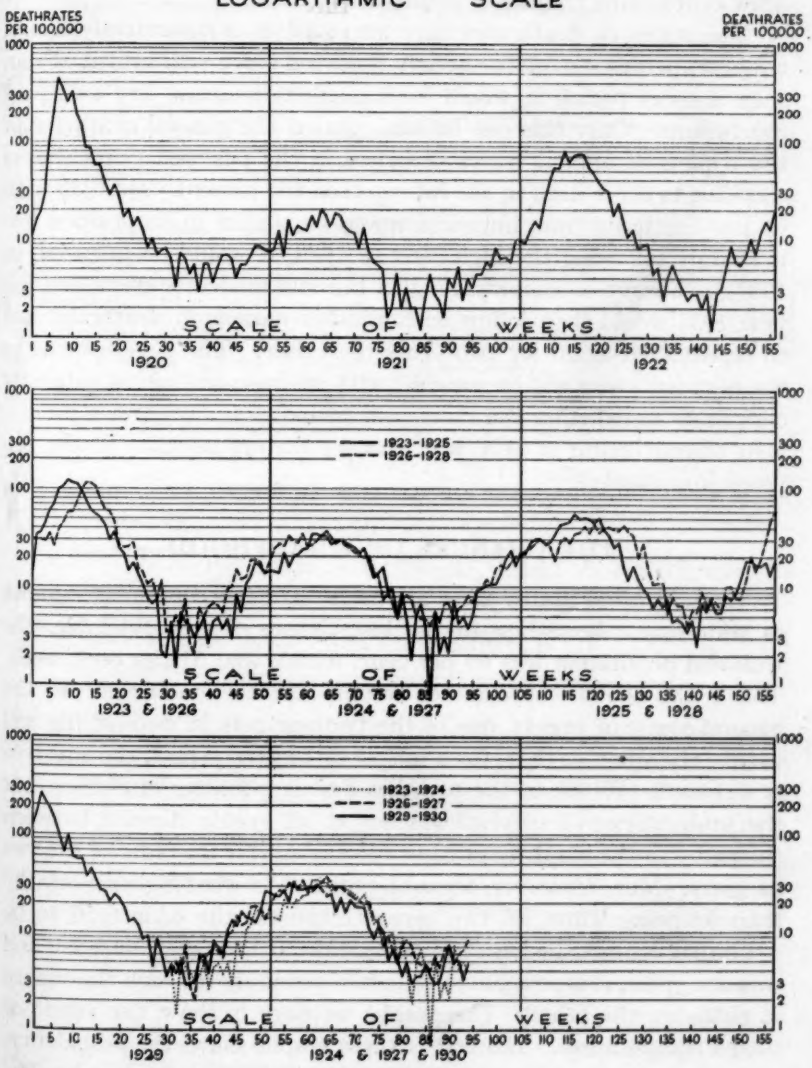
the three years 1920 to 1922 inclusive. The second panel contains, superimposed upon each other, the graphs for the deathrates of the two series 1923 to 1925 and 1926 to 1928. The third panel contains the graph for the years 1929 and 1930, so far as at present available. A glance at these graphs immediately shows a parallel tendency in the run of the graphs for the several three-year periods. The likeness is particularly close for the second and third three-year periods, that is, 1923 to 1925 and 1926 to 1928. For this reason these two periods have been plotted on one panel, the first period in a solid line, and the second in a line of dashes. As compared with the other two series, the early series, 1920 to 1922 is slightly atypical. The year 1920 had an exceptionally high influenza deathrate and this was followed by the somewhat subnormal deathrate in the next year, 1921.

The likeness in the successive waves of the influenza deathrate is particularly marked in the second wave of each panel, and more particularly in the second wave of the second and third panels. To illustrate this at a glance we have inserted in the third panel not only the graph of the deathrates for the year 1930, but also, in a dotted line and in a line of dashes, the corresponding waves of the two prior series, that is, for the years 1924 and 1927. It will be seen that the three sets of deathrates wind about each other to form an almost solid mass showing a close likeness between the three waves. Just as the high peaks in the influenza deathrate occur three years apart, so also this typical second wave occurs every three years. Only in the first series, that is in the year 1921, this second wave is somewhat below normal. Not only do the individual waves of the three cycles bear a marked resemblance to each other, but the general form of the three waves in each cycle, taken as a whole, is characteristic: A wave of maximum height, with deathrates invariably over 100 per 100,000 per annum for the worst week, is followed by the markedly smaller wave, and then in turn by a somewhat larger wave, but neither of these two latter waves ever reaches a figure of 100 per 100,000 per annum. So far as the series of observations reported upon here is concerned, this rule is without exception.

Curiosity may naturally be felt as to how the pandemic of 1918 might fall into line with this series. It is to be noted that it came more than one year later than might be expected from the three-year cycle. But the 1918 epidemic was somewhat abnormal in several respects; in particular, it fell at an unusual time of the year. All crests of the waves in the series 1920 to 1930 fell in the winter and early spring months, usually February or March. The epidemic

THREE-YEAR PERIODICITY OF INFLUENZA

*Deathrates*per 100,000 among Industrial Policyholders of the Metropolitan Life Insurance Company: Jan. 1920-Oct. 1930*



*Week-by-week figures expressed on an annual basis

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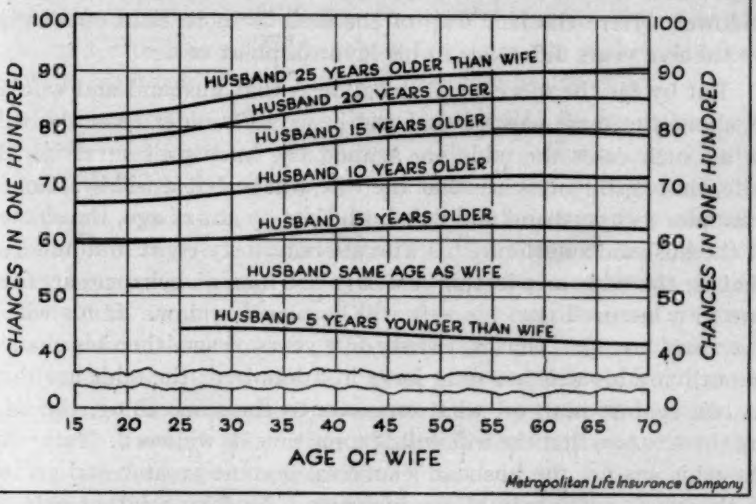
of 1918, it will be remembered, began with a sudden explosion in September. It ran high during the whole of the rest of the year and had not entirely subsided until April or May of 1919. The great pandemic of 1918, both as to its character and its time of occurrence, is thus essentially out of line with this series, and makes us slow to draw conclusions relative to future occurrences.

The series of deathrates here surveyed is comparatively short; ten years permit a sequence of only three full three-year cycles. From such a short period it would be hazardous to draw any sweeping conclusions. Only this can be said, that if the general character of the triplets of annual waves observed in the past ten years should continue to show itself in the future, then the present year 1930 with its low deathrate from influenza would be typical in its position immediately following the high crest of 1929; it would be followed, in 1931, by a wave of somewhat higher but still moderate crest; and the year 1932 would then follow with another maximum deathrate, not to be equalled again for two years thereafter. The development in the next few years will be watched with interest, and one is naturally curious to see whether the three-year periodicity will prove a permanent characteristic or only a temporary feature peculiar to the ten years just elapsed.

THE CHANCES OF WIDOWHOOD

In the United States there are more than twice as many widows as widowers. According to the last Census figures available, the widowed population was 69 per cent. female and 31 per cent. male. This is the obvious outcome of certain familiar conditions. In the natural course of events, one of the two partners in wedded life will outlive the other, so that, for a longer or shorter period, the survivor is widowed. Which of the two dies first is a matter of chance, but the probabilities of survival are not at all evenly divided between the two. In the majority of cases the husband is the older of the two partners. Men, moreover, are subject to a somewhat higher mortality than women. Thus, on two separate counts, the odds tend to be somewhat against the husband's survival. If the age of husband and wife are given, it is possible to calculate definitely for each the chance of outliving the other. The graphs on page 5 show the result of such a computation. The first of these graphs shows the probability, for a wife of given age, that she will survive her husband. The second graph similarly shows, for a husband of given age, the chances that he will survive his wife.

CHANCES, IN ONE HUNDRED, THAT A WIFE OF SPECIFIED AGE WILL SURVIVE HER HUSBAND, FOR SPECIFIED AGE DIFFERENCE OF COUPLE



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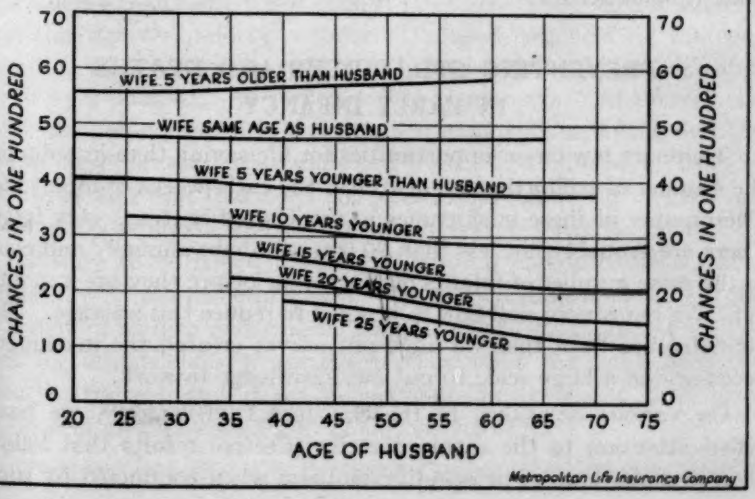
CHANCES, IN ONE HUNDRED, THAT A HUSBAND OF SPECIFIED AGE WILL SURVIVE HIS WIFE, FOR SPECIFIED AGE DIFFERENCE OF COUPLE



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If the wife is older than the husband—a rather unusual situation —the odds may be in favor of the husband surviving his wife. So, for example, if the wife is thirty-five years old, and the husband thirty, the chances are fifty-six in a hundred, or just a little better than even, that the husband will survive his wife and so be left a widower. Here the handicap of the male is more than outweighed by the five years difference in his favor in point of age.

But by far the more usual situation is that husband and wife are of about the same age, or that the husband is older than the wife. In all such cases the odds are against the husband's surviving the wife, that is, the odds are that the wife will be left a widow. So, for example, with husband and wife both thirty years of age, the chances of the husband's outliving his wife are only forty-eight in a hundred, that is, the odds are, in this case, against him, and chances are fifty-two in a hundred that his wife will become a widow. If his wife is five years younger, that is, twenty-five years of age, then his chances of outliving his wife are only forty in a hundred; the odds are three to two against him, or, what amounts to the same thing, the odds are three to two that the wife will at some time be widowed. Naturally, the odds against the husband's survival become greater and greater as the wife's advantage in age increases. To take a rather extreme case, if the wife is fifteen years younger than the husband, the latter being forty years of age, the chances of the husband outliving the wife are only twenty-six in a hundred, or the odds are three to one against him, or three to one that the wife will become a widow at some time in her life.

PREVENTING STILLBIRTHS AND DEATHS IN EARLY INFANCY

There are few larger opportunities for life saving than in reducing the number of stillbirths and deaths in the early weeks of infant life. The number of these misfortunes in the United States is very large. There are probably not less than 90,000 stillbirths annually and close to the same number of infants die each year before they are a month old. We know very well how to proceed to reduce this wastage. The difficulty has been that we have not as yet created the machinery necessary on a large scale to put our knowledge to work.

On various occasions, in the STATISTICAL BULLETIN, we have called attention to the extraordinarily effective results that follow from prenatal care of prospective mothers when conducted by such

organizations as the MATERNITY CENTER ASSOCIATION OF NEW YORK and by other nursing groups that specialize in this field of health service. It is entirely safe to say that the number of stillbirths and the number of early infant deaths can be reduced by at least one-half through the application of the thoroughly tried methods of these organizations. One could justify even larger claims. But even the more moderate claims indicate how large are the stakes and how great the opportunity is in this field of public health effort.

More recently, another procedure has come to the fore which will contribute materially to the saving of infants to the community. Professor Yandell Henderson, of Yale University, has suggested that the lives of thousands of newborn infants who do not breathe immediately after birth, and thousands of others who suffer from imperfect breathing during the first few minutes after birth, can be saved by the same methods of stimulating respiration as are used in the resuscitation of adults who have been partially asphyxiated, namely, the therapeutic inhalations of carbon dioxide diluted in air or oxygen.* In certain hospitals, breathing by newborn babies has been started through this means. The difficulty in the way of applying this method on a large scale is that only a relatively small number of babies are born in those hospitals where this treatment is available.

Professor Henderson is sanguine in his claims for the effectiveness of his method of stimulating breathing among the newborn. He has assumed that 25 per cent. of the cases can be given life by proper inhalational treatment. But even if later experience should indicate that this figure should be materially reduced, the field for life conservation is, nevertheless, very large indeed and should be cultivated as far as is possible. As Professor Henderson says: "At present our cities are well equipped to treat carbon monoxide asphyxia, and the rescue crews save a large number of lives. The number of cases of neo-natal asphyxia that could be saved is probably far larger than those of CO asphyxia, and almost no provision is made for them." It is certainly to be hoped that every hospital and institution where babies are born will be provided with resuscitation apparatus, with cylinders of oxygen and carbon dioxide. Until that time, it will be well for obstetricians to remember that when the baby does not breathe, the fire and police departments in their city have such equipment and they should avail themselves of it.

*Henderson, Yandell, Ph.D. "The Prevention and Treatment of Asphyxia in the Newborn." *Journal of The American Medical Association*, Vol. 90, pp. 583-586.

TEXAS AND THE REGISTRATION AREA

The Registration Areas for both births and deaths now include every state in the Union with two exceptions, South Dakota and Texas. There is reason to believe that the recent test of registration conditions in South Dakota by the United States Census Bureau will prove so successful that that state will be admitted before the close of the current year. As regards Texas, the situation is more difficult. Appropriations for vital statistics in that state have been utterly inadequate with the result that the indexing of birth and death certificates has fallen far behind and for that reason it is not possible to determine readily how complete registration is.

Too much emphasis cannot be placed on the importance of admitting Texas to the Registration Area; for the failure of this single state to provide for accurate vital statistics places America in a most unenviable situation among the civilized countries. Until Texas is admitted it will be impossible, as it always has been, to compute mortality rates and birthrates for the United States as a whole and to compare these rates with those which are available for every other civilized country.

Early in the past decade the Bureau of the Census adopted a slogan, "Every State in the Registration Area by 1930." At that time nine states were outside the death registration area and 15 states had not come into the birth registration area. Intensive work by the Census Bureau, in which many civic and professional organizations assisted, has brought the vital statistics of all of these states, save Texas, up to the required standard. It is earnestly hoped that this unfortunate situation will soon be righted and that this state will measure up to the requirements for entry into the registration areas.

HEALTH RECORD FOR OCTOBER, 1930

Unless a severe setback takes place in the last six weeks of 1930, the year is destined to be recorded as the best of all health years to date. Among Metropolitan Industrial policyholders living west of the Rocky Mountains, the improvement in the deathrate for the first ten months amounted to 5.8 per cent. as compared with the like part of 1929, and for those in the rest of the United States to 8.8 per cent. Canada, also, is enjoying unprecedentedly favorable health conditions. Among one and a quarter million Metropolitan Industrial policyholders in that country, the cumulative deathrate at the end of October was 6.4 per cent. lower than in the like part of last

year. For the entire group of Industrial policyholders the year-to-date deathrate for the ten-month period was 8.7 per 1,000 as compared with 9.5 in 1929, a drop of 8.3 per cent. Reports recently received by the Company indicate that health conditions have continued favorable for the first two weeks of November.

Health conditions during the month of October were better than the average for that month and showed marked improvement over October, 1929.

Attention has been directed in previous STATISTICAL BULLETINS, this year, to the chief factors which have helped to make 1930 the best of all health years. The most important is the absence of widespread prevalence of any of the infectious diseases. Influenza, in particular, which was responsible for a cumulative deathrate of 46.0 per 100,000 for the January-October period of 1929, has recorded a rate of only 14.7 this year. The drop in influenza has probably been the chief influence in bringing the pneumonia mortality rate down from 91.3 per 100,000 in 1929 to 75.7 in 1930. The considerable declines observed this year in the mortality from organic heart disease and chronic nephritis are due, largely, to the improved influenza situation, since this disease invariably hastens the deaths of many persons who suffer from chronic diseases.

The tuberculosis deathrate for the ten-month period is 82.1 per 100,000 as compared with 88.9 last year—a drop of 7.6 per cent. For tuberculosis of the respiratory system the drop was 9.0 per cent. The 7.6 reduction in tuberculosis mortality, if maintained up to the end of the year, will signalize the saving of 1,300 lives of insured persons who would have died from this disease on the basis of last year's deathrate. But the 1930 record for diphtheria is perhaps the most noteworthy of all. The diphtheria deathrate has actually dropped thirty per cent. in a single year, and almost fifty per cent. in three years. These remarkable decreases are unquestionably the direct outgrowth of the growing use of toxin-antitoxin immunization and of early antitoxin treatment in cases where children actually contracted diphtheria.

Other diseases which bid fair to register a lower mortality rate in 1930 than ever before, are diarrheal complaints, puerperal diseases and typhoid fever.

There are still other encouraging items in the 1930 health record up to the end of October. The cancer deathrate shows a drop; so does that for diabetes. These declines are small and would be of no significance but for the fact that they mark a check, at least, in the increase which has been observed for years.

Suicides have been somewhat more frequent than during the January-October period of last year; and a small increase is in evidence for homicides. The cumulative deathrate for automobile fatalities is 20.2 per 100,000 as compared with 19.9 in 1929.

The deathrate in the general population of the large cities of the United States, in October, was 10.8 per 1,000 population as compared with 10.2 for September, 1930, and 11.6 for October, 1929. Diseases showing higher prevalence in October as compared with September were diphtheria, influenza, measles, poliomyelitis, scarlet fever and smallpox. There were fewer cases of typhoid fever reported than during the previous month. Comparison with October a year ago, however, shows less sickness from diphtheria, influenza, measles, scarlet fever and smallpox together with more cases of typhoid fever and poliomyelitis.

Reports from thirty-seven states show 5,755 cases of diphtheria reported during the first four weeks of October, as compared with 3,459 for the corresponding weeks of September. This is about the usual seasonal increase. Indiana, North Carolina, Tennessee, Alabama, Mississippi and Oklahoma were the states to show the more noteworthy rises in diphtheria morbidity. The increase in measles cases was pronounced, 2,644 being reported in October against 1,414 in September. The increase was widespread, but most pronounced in Massachusetts, Wisconsin, Colorado and Oregon. Scarlet fever was nearly twice as prevalent in October as in September. The rise was general throughout the country, but most pronounced in New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois and West Virginia. Considerable increases in smallpox cases were reported from Michigan, Minnesota, Missouri, North Dakota and Washington.

There were almost five times as many cases of poliomyelitis in October as during the same month last year and case-reports increased from 2,008 in September to 2,166 in October. The most notable increases were in Massachusetts, Indiana, Michigan, South Dakota and Nebraska. The greatest number reported from any one state was 284, in California, in which state 240 cases were reported in September.

The CANADIAN HOUSE OF COMMONS approved a plan to establish county health units throughout the Dominion similar to those already at work in Quebec, Saskatchewan and British Columbia. The BELLEVUE-YORKVILLE HEALTH DEMONSTRATION (New York City) will carry on an intensive social hygiene campaign in that district in October, November and December. NEW YORK STATE has made trichinosis a reportable disease beginning October 1, 1930.

The following table shows the mortality among Industrial policyholders for October, 1930; September, 1930, and October, 1929, together with the cumulative deathrate for the first ten months of each year.

METROPOLITAN LIFE INSURANCE COMPANY

Deathrates* per 100,000 for Principal Causes, Premium-Paying Business in Industrial Department (Annual Basis)

MONTHS OF OCTOBER, 1930; SEPTEMBER, 1930, AND OF OCTOBER, 1929

CAUSES OF DEATH	RATE PER 100,000 LIVES EXPOSED*				
	Oct. 1930	Sept. 1930	Oct. 1929	Cumulative Jan.—Oct., 1930	Cumulative Jan.—Oct., 1929
TOTAL—ALL CAUSES	810.3	782.8	852.7	873.3	952.0
Typhoid fever	4.4	4.1	3.6	2.2	2.4
Measles	.3	.6	.4	3.2	3.3
Scarlet fever	1.3	1.1	1.3	2.6	2.6
Whooping cough	2.7	4.6	3.8	4.5	6.1
Diphtheria	5.0	2.7	8.4	5.8	8.3
Influenza	6.7	5.5	9.2	14.7	46.0
Tuberculosis (All forms)	75.0	72.8	81.3	82.1	88.9
Tuberculosis of resp'y system	67.4	63.9	70.2	71.4	78.5
Cancer	82.4	78.9	78.1	77.2	77.5
Diabetes mellitus	16.9	15.8	17.0	18.3	18.7
Cerebral hemorrhage	55.7	54.5	56.6†	59.7	57.9†
Organic diseases of heart	130.4	121.6	130.7	143.7	148.4
Pneumonia (All forms)	46.5	34.5	54.1	75.7	91.3
Other respiratory diseases	9.2	8.8	10.6	11.1	12.3
Diarrhea and enteritis	38.5	40.2	32.3	21.0	21.9
Bright's disease (Chronic nephritis)	61.9	59.1	68.1	67.4	70.1
Puerperal state	10.1	10.4	10.6	12.2	13.6
Suicides	10.0	9.5	8.6	9.6	8.7
Homicides	6.9	7.4	7.7	6.6	6.5
Other external causes (excluding suicides and homicides)	59.5	64.5	67.0	62.5	64.8
Traumatism by automobiles	23.4	23.7	26.2	20.2	19.9
All other causes	187.4	186.2	203.0	193.2	202.6

*All figures in this table include insured infants under one year of age. The rates for 1930 are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

†Rate not comparable with that for 1930.

Correspondence on the subjects discussed in these BULLETINS may be addressed to: The Editor,

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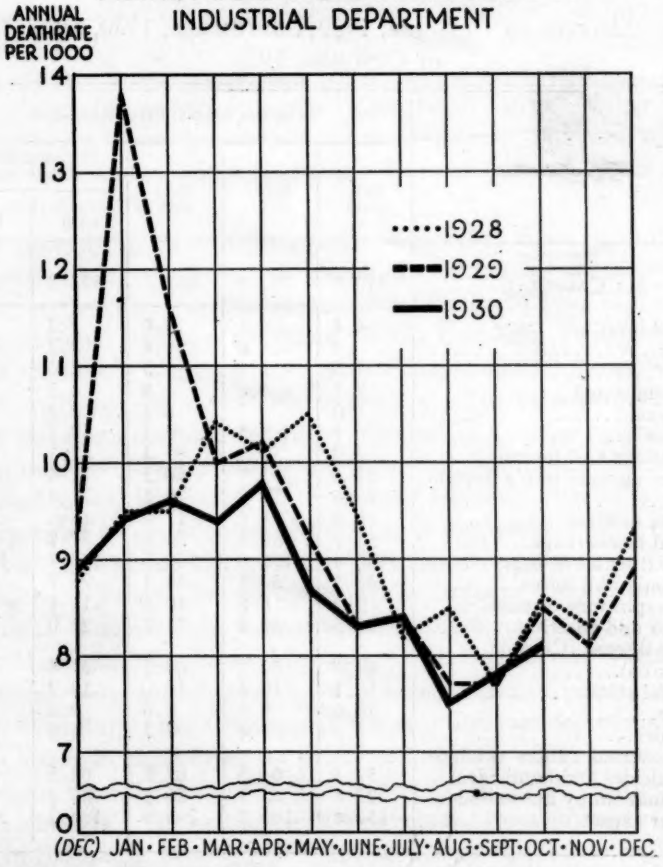
DEATHRATES
FROM ALL CAUSES

METROPOLITAN LIFE INSURANCE CO.
INDUSTRIAL DEPARTMENT



1928*	9.5	9.5	10.4	10.1	10.5	9.5	8.2	8.5	7.7	8.6	8.3	9.3
1929*	13.8	11.6	10.0	10.2	9.2	8.3	8.4	7.7	7.7	8.5	8.1	8.9
1930	9.4	9.6	9.4	9.8	8.7	8.3	8.4	7.5	7.8	8.1		

* Rates for 1928 and 1929 are final.

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